Code: DE04 **Subject: ENGINEERING MATERIAL**
Time: 3 Hours **Max. Marks: 100**

JUNE 2011

NOTE: There are 9 Questions in all.

- **Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.**
- **The answer sheet for the Q.1 will be collected by the invigilator after 45 Minutes of the commencement of the examination.**
- **Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.**
- **Any required data not explicitly given, may be suitably assumed and stated.**

Q.1 Choose the correct or the best alternative in the following: **(2×10)**

a. Hard magnetic materials are used for making

(A) Permanent magnets **(B)** Conductors
(C) Temporary magnets **(D)** Insulators

b. Number of Terminals in a MOSFET are

(A) Two **(B)** Three
(C) Four **(D)** Five

c. Insulators have

(A) A full valence band **(B)** An empty conduction band
(C) A large energy gap **(D)** All the above

d. Tick off the material, which is different from the group?

(A) Constantan **(B)** Manganin
(C) Nichrome **(D)** Brass

e. Which of the following property of PVC is of prime importance?

(A) Strength **(B)** Appearance
(C) Colour **(D)** Non inflammability

f. Barrier potential in a p-n Junction is caused by

(A) Thermally generated electrons and holes
(B) Diffusion of majority carriers across the junction
(C) Migration of minority carriers across the junction
(D) Flow of drift current

g. The property due to which the resistance of some metal or compo vanishes under certain condition is

(A) semi conductivity **(B)** super conductivity
(C) curie point **(D)** magnetostriction

h. Dielectric materials are

(A) Insulating materials **(B)** Semi conducting materials
(C) Magnetic materials **(D)** Ferro electric materials

i. The property of materials by which it can be rolled into sheets is called?

(A) Plasticity **(B)** Elasticity
(C) Malleability **(D)** Ductility

j. A transistor has

(A) one p-n junction **(B)** two p-n junction
(C) four p-n junction **(D)** five p-n junction

Answer any FIVE Questions out of EIGHT Questions.
Each question carries 16 marks.

Q.2 a. Differentiate between diamagnetic, paramagnetic and ferromagnetic Materials, give one example of each. **(8)**

b. Draw B-H curve for magnetic materials used in electric machines and explain (i) Hysteresis loop (ii) Permeability **(8)**

Q.3 a. Explain the following:
(i) Permanent magnetic materials
(ii) Thermocouples. **(4+4)**

b. What is a p-n junction? Draw and Explain V-I characteristic of a p-n junction diode. **(8)**

Q.4 Define Polarization of a dielectric material. Explain the different types of polarization and the effect of frequency of applied electric field on them. **(2+8+6)**

Q.5 Explain the energy bands in Solids. Also classify the materials based on the energy bands and explain their properties. **(8+8)**

Q.6 a. Explain the suitability of copper and aluminium that is used as electrical conducting materials. **(8)**

b. Explain the electron gas model of a metal. **(8)**

Q.7 a. Explain the terms
(i) Mobility
(ii) Doping
(iii) Diffusion
(iv) Ferro electricity **(8)**

b. Explain various magnetic materials with examples. **(8)**

Q.8 a. Explain properties and application of polymers. **(8)**

b. What are the important requirements of a good insulating material? **(8)**

Q.9 Write short notes on any **FOUR**

(i) Effect of electric field on super conductor
(ii) MOSFET
(iii) Hall Effect
(iv) Einstein relation (between diffusion constant and mobility)
(v) Applications of carbon and graphite. **(4×4)**